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### Claims Listing

1    **1.    (currently amended)** ~~An~~ A dynamic optical router for routing optical  
2    ~~signals to a plurality of output channels, comprising at least one frequency router~~  
3    ~~having a plurality of input ports and a plurality of output ports, characterized in~~  
4    ~~that: each optical signal contains destination information, at least one input port~~  
5    ~~simultaneously receives at least two optical signals to be frequency routed, and~~  
6    ~~at least one output port simultaneously presents presenting~~ at least two  
7    ~~frequency routed optical signals, and at least one output port couples routed~~  
8    ~~optical signals to a plurality of output channels, wherein each optical signal to be~~  
9    ~~frequency routed is dynamically tuned to a particular color colored~~ in response  
10   ~~to its~~ destination information.

1    **2.    (original)** The optical router of Claim 1, further comprising:  
2                   a plurality of combiners, one combiner for combining the at least  
3                   two optical signals to be routed; and  
4                   a plurality of receivers, one receiver for separating each of the at  
5                   least two routed optical signals to intended destinations in response to  
6                   destination information.

1    **3.    (original)** The optical router of Claim 2, wherein the frequency router  
2    routes optical signals by color, the at least two optical signals to be routed having  
3    different colors, and the at least two routed optical signals having different  
4    colors.

1 4. (original) The optical router of Claim 3, wherein the optical router  
2 receives packets of data, each packet of data having destination information, each  
3 combiner coupled with at least one converter of a plurality, each converter  
4 converting at least one packet of data to an optical signal colored in response to  
5 the destination information of the corresponding at least one packet of data.

1 5. (currently amended) The optical ~~router converter~~ of Claim 4, wherein the  
2 frequency router comprises:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 6. (original) The optical router of Claim 5, wherein each receiver comprises:

2 at least two tunable filters; and

3           at least one splitter for splitting the at least two routed optical  
4 signals between the at least two tunable filters such that at least one of the  
5 at least two tunable filters is tuned to pass one of the at least two routed  
6 optical signals to an intended destination.

1   7.   (original) The optical router of Claim 5, wherein each receiver comprises:

2           at least two second stage converters;

3           at least one demultiplexer for separating each of the at least two  
4 routed optical signals into one of the at least two second stage converters,  
5 each second stage converter converting one of the routed optical signals to  
6 a second stage optical signal colored in response to the destination  
7 information of the corresponding at least one packet of data; and

8           at least one second stage combiner for combining second stage  
9 optical signals into a combined second stage optical signal to be frequency  
10 routed.

1   8.   (original) The optical router of Claim 7, further comprising:

2           a second stage frequency router having a plurality of second stage  
3 input ports and a plurality of second stage output ports, one second stage  
4 input port receiving the combined second stage optical signal to be  
5 frequency routed; and

6           a plurality of output stage demultiplexers, each output stage  
7 demultiplexer being coupled one second stage output port of the second

8 stage frequency router such that each second stage optical signal of the  
9 combined routed second stage optical signal is presented to an intended  
10 destination.

1 9. (currently amended) ~~An~~ A dynamic optical router for routing a plurality  
2 of packets, N, of data to a plurality of output channels, each packet of data  
3 having destination information, the optical router comprising:

4 a plurality of converters, each converter receiving a packet of data  
5 and providing an optical signal to be combined and routed, each optical  
6 signal being colored in response to the destination information of the  
7 respective packet of data;

8 a plurality of combiners, one combiner combining at least two  
9 optical signals to be routed; characterized by:

10 at least one frequency router having a plurality of input ports, M,  
11 and a plurality of output ports, M, at least one output port simultaneously  
12 receiving the at least two optical signals to be routed, ~~and~~ at least one  
13 output port simultaneously presenting at least two routed optical signals,  
14 and at least one output port coupling routed optical signals to a plurality  
15 of output channels, the at least one frequency router routing optical  
16 signals by color dynamically in response to said destination information;

17 a plurality of receivers having a plurality of outputs corresponding  
18 to said output channels, which in turn correspond to intended  
19 destinations; and

20 a plurality of splitters, one splitter splitting the at least two routed  
21 optical signals ~~between at least two receivers such that~~ along separate

22 ~~optical paths toward at least two output channels, at least one of the at~~  
23 ~~least two receivers; a receiver in one of the paths being is~~ tuned to pass one  
24 of the at least two routed optical signals to an intended destination.

1 10. (original) The optical router of Claim 9, wherein each converter comprise  
2 a tunable light source for generating one optical signal, and for coloring the one  
3 optical signal in response to the destination information of the respective packet  
4 of data, and wherein each receiver comprises a tunable filter for tuning to a color  
5 to pass one of the at least two routed optical signals to an intended destination.

1 11. (original) The optical router of Claim 10, wherein each converter  
2 comprises a converter for converting at least one packet of data to the one optical  
3 signal colored in response to destination information, and wherein each receiver  
4 comprises a converter for converting a routed optical signal into a routed packet  
5 of data.

1 12. (original) The optical router of Claim 11, further comprising a scheduler  
2 for scheduling the conversion each packet of data into an optical signal and for  
3 scheduling the tuning of the tunable filter.

1 13. (currently amended) The optical ~~router converter~~ of Claim 11, wherein  
2 the frequency router comprises:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 14. (currently amended) ~~An A dynamic~~ optical router for routing a plurality  
2 of packets, N, of data to a plurality of output channels, each packet of data  
3 having destination information, the optical router comprising:

4 a plurality of first stage converters, each converter receiving a  
5 packet of data and providing an optical signal to be combined and routed,  
6 each optical signal being colored in response to the destination  
7 information of the respective packet of data;

8 a plurality of first stage combiners, one combiner combining at least  
9 two optical signals to be routed; characterized by:

10 a first stage frequency router having a plurality of input ports, M,  
11 and a plurality of output ports, M, at least one input output-port  
12 simultaneously receiving the combined at least two optical signals to be  
13 routed, ~~and~~ at least one output port simultaneously presenting at least  
14 two first stage routed optical signals and at least one output port coupling  
15 routed optical signals to a plurality of output channels, the first stage

16 frequency router routing optical signals by color dynamically in response  
17 to said destination information;

18 a plurality of second stage converters, each second stage converter  
19 providing a second stage optical signal to be combined and routed, each  
20 second stage optical signal being colored in response to the destination  
21 information of the respective packet of data; and each second stage  
22 converter including a buffer that delays selected packets based on the  
23 destination information;

24 a plurality of second stage demultiplexers, one second stage  
25 demultiplexer presenting each of the at least two routed optical signals  
26 from the first stage frequency router to a second stage converter;

27 a plurality of second stage combiners, one second stage combiner  
28 combining at least two second stage optical signals to be routed; and

29 a second stage frequency router having a plurality of second stage  
30 input ports, M, and a plurality of second stage output ports, M, at least  
31 one second stage input port simultaneously receiving at least two second  
32 stage optical signals to be routed, ~~and~~ at least one second stage output  
33 port simultaneously presenting at least two second stage routed optical  
34 signals, and at least one output port coupling routed optical signals to a  
35 plurality of output channels. the second stage frequency router routing  
36 second stage optical signals by color dynamically in response to said  
37 destination information.

1 15. (original) The optical router of Claim 14, further comprising a plurality of  
2 output stage receivers, each output stage receiver having an output stage

3 demultiplexer, one output stage demultiplexer presenting each of the at least two  
4 second stage routed optical signals from the second stage frequency router to an  
5 intended destination.

1 16. (original) The optical router of Claim 14, further comprising a plurality of  
2 output stage receivers, each output stage receiver comprising:

3 at least two tunable filters for tuning to a color; and

4 a splitter coupled with the at least two tunable filters, wherein one  
5 output stage receiver splits the at least two second stage routed optical  
6 signals between the corresponding at least two tunable filters such that at  
7 least one of the at least two tunable filters is tuned to pass one of the at  
8 least two second stage routed optical signals to an intended destination.

1 17. (original) The optical router of Claim 14, wherein each first stage  
2 converter comprises a first stage tunable light source for generating one optical  
3 signal, and for coloring the one optical signal in response to the destination  
4 information of the respective packet of data, each second stage converter  
5 comprises a second stage tunable light source for generating one second stage  
6 optical signal, and for coloring the one second stage optical signal in response to  
7 the destination information of the respective packet of data, and further  
8 comprising a scheduler for scheduling the coloring of each optical signal and  
9 each second stage optical signal.



1 18. (original) The optical router of Claim 17, wherein each first stage  
2 converter comprises a first stage converter for converting at least one packet of  
3 data to the one optical signal colored in response to destination information of  
4 the respective packet of data, each second stage converter comprises a second  
5 stage converter for coloring one second stage optical signal in response to  
6 destination information of the respective packet of data.

1 19. (original) The optical router of Claim 14, wherein at least one of the first  
2 and the second stage frequency routers comprise:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 20. (original) The optical router of Claim 14, wherein ~~the first and the second~~  
2 ~~stage frequency routers are formed by one frequency~~ each second stage  
3 ~~converter, in response to destination information, re-colors the optical signals~~  
4 ~~that are received thereby.~~

1 21. (currently amended) A method for routing optical signals to a plurality of  
2 output channels comprising:

3 determining a first, second and third destination for a first, second  
4 and third packet of data, respectively;

5 generating a first, second and third carrier signal having a first,  
6 second and third frequency associated with the first, second and third  
7 destinations, respectively;

8 modulating the first, second and third carrier signals in response to  
9 the first, second and third packets of data to form a first, second and third  
10 optical signal; and

11 routing the first, second and third optical signals by a frequency  
12 routing device, the routing characterized by comprising:

13 simultaneously receiving in a first input of a frequency  
14 router at least two of the first, second and third signals; and

15 simultaneously presenting from a first output of the  
16 frequency router at least two of the first, second and third routed  
17 optical signals; and coupling routed optical signals from at least  
18 one output port to a plurality of output channels.

1 22. (currently amended) A method for routing a plurality of optical signals to  
2 a plurality of output channels as a function of color through a router having a  
3 plurality of inputs-input ports and a plurality of outputs-output ports, the  
4 method comprising characterized by the steps of:

5 simultaneously receiving ~~to~~ at at least one of the input ports at least  
6 two optical signals respectively colored as a function of destination information  
7 contained therein; and

8 simultaneously presenting ~~from~~ to at least one of the output ports  
9 at least two optical signals routed as a function of their color; and coupling  
10 routed optical signals from at least one output port to a plurality of output  
11 channels.

1 23. (currently amended) The method of claim 22, after the presenting step  
2 further comprising the step of processing each of the presented at least two  
3 routed optical signals from the at least one of the output ports.

1 24. (currently amended) The method of claim 22, ~~wherein the step of~~  
2 ~~simultaneously applying to at least one of the input ports comprises further~~  
3 comprising the step of coloring each optical signal of the plurality is as a further  
4 function of which input port of the plurality of input ports it is applied to.

1 25. (original) A method for use in conjunction with a router which has a  
2 plurality of input ports and plurality of output ports, said router being of a type  
3 which routes optical signals applied to its input ports to particular ones of said  
4 output ports as a function of the respective colors of said optical signals, the  
5 method:

6 applying each of a plurality of optical signals to a respective one of the  
7 input ports, this including the step of concurrently applying to an  
8 individual one of said input ports at least two optical signals which have  
9 been respectively colored as a function of destination information

10 contained in said optical signals, at least two of said optical signals being  
11 concurrently routed to a particular one of said output ports.

1 26. (original) The invention of claim 25, comprising the further step of  
2 concurrently removing from said particular one of said output ports said two  
3 optical signals concurrently routed thereto.

1 27. (original) The invention of claim 25, wherein the coloring of each said  
2 optical signal is a further function of which input port it is applied to.